factor would then be used for all CBGs in the study area.[101] This approach will allow the model to take into account factors affecting expenses which are not represented directly in BCPM, while preserving the simplicity of a per-line factor in the calculation.

This approach addresses several of the Commission's concerns. For example, the FNPRM asks whether different expense estimates should be used for small, medium, and large companies.[102] The empirical model takes into account various measures of demand, such as the number of lines and the number of calls, when it estimates expenses for each study area. Similarly, the Commission asks whether maintenance expenses should depend on plant mix.[103] To the extent that plant mix does affect maintenance expense, the empirical model will capture this effect. The Commission also inquires about the effect of climate and soil factors.[104] These effects, which would be very difficult to measure by means of an engineering simulation, can be captured through the firm-specific variables in the empirical model.

GTE urges the Commission to use the results of the empirical model to improve the accuracy of the expense estimates in its universal service model. Both the Hatfield and BCPM models use relatively simple algorithms to calculate expenses, using factors driven by either lines or investments. The per-line approach, as used in the BCPM, can

---

[101] Alternatively, a per-line expense factor, developed on an aggregate basis, could be adjusted to reflect the effects of time and geography estimated by the empirical model.

[102] FNPRM, ¶ 157.

[103] FNPRM, ¶ 162.

[104] FNPRM, ¶ 162.

be improved through the application of evidence from the empirical model concerning the variation of expenses, both over time and across geographic areas.

XVI. THE SELECTED COST MECHANISM WILL NEED TO BE REEVALUATED EACH YEAR AND ADJUSTED FOR INFLATION. (Section III.C.8)

The FNPRM asks if an adjustment must be made to the universal service cost mechanism on an annual basis and whether it should be tied to inflation.[105] As the selected mechanism moves closer to a proxy model and farther from using actual costs, it will require Commission review more frequently. Since a cost proxy model does not use actual data, it will need to be reviewed at least once annually to ensure that sufficient funding is being provided for universal service and that the effects of inflation are taken into account.

The Commission also asks if a productivity offset similar to that used in the price cap mechanism should be included in the selected mechanism.[106] Neither a cost proxy mechanism nor a carrier-specific engineering model would require a productivity offset. Since both a cost proxy mechanism and carrier-specific models include forward-looking costs and technologies, increases in productivity would already be taken into account by the models. No additional offset is necessary.

---

[105] FNPRM, ¶ 173.

[106] FNPRM, ¶ 173.

XVII. UNIVERSAL SERVICE SUPPORT SHOULD BE PROVIDED ON THE BASIS OF CENSUS BLOCK GROUPS ("CBGs"). (Section III.D)

The Commission requests comment on whether it should provide support on a geographic area other than that used to calculate costs.[107] Although GTE supports the use of grid cells for the calculation of costs, support should be provided to carriers on the basis of CBGs. The Commission also asks about the usefulness of geo-coding.[108] As GTE has explained in its prior pleadings, geo-coding of data samples will increase the accuracy of customer distribution estimates but is not feasible for all households on a national basis.[109] However, the Commission should also recognize that geo-coding is less accurate for rural areas because rural addresses may contain more complexities, which lead to inaccurate assignment, such as rural customers who use Residential Post Office ("RPO") zip codes which indicate the address where they pick up their mail as opposed to the zip code of the customer's physical residence.

The Commission notes that the California Public Utilities Commission has adopted a state universal service mechanism based on BCPM that uses CBGs to calculate support levels.[110] To comply with California regulations, GTE is required to assign each customer's primary residential line to a CBG which is done via geo-coding. Once the CBG is assigned, GTE must maintain the "geo-coded" record off-line in a

---

[107] FNPRM, ¶ 176.

[108] FNPRM, ¶ 176.

[109] Comments of GTE Service Corporation, CC Docket Nos. 96-45, 97-160 at 11-12 (filed Sept. 2, 1997).

"Master File." Monthly reconciliations of residential customer address records from GTE's billing system and the Master File in order to define the high-cost block group files. Non-matched records are processed through commercial database/software and all new geo-coded records are added to the Master File. Any exceptions (or non-geo-coded) records must then be manually assigned to a CBG. Maintenance of the Master File is dependent upon the accurate input of data by an individual trained in mapping and geo-coding, particularly in those instances where an address is temporarily inactive due to population mobility.

As with rural customers, inaccuracies can occur when addresses contain post office box numbers rather than a street names or when the city and/or zip code areas cross CBGs. One possible solution may be to use a wire-center average cost for customer lines that cannot be assigned to a CBG using commercial software/database, but this averaging method would understate the cost of the non-geo-coded lines.

XVIII. CONCLUSION

The complexity of developing accurate input values for determining the costs of providing universal service gives further support to GTE's position that an auction mechanism (with interim use of carrier-specific engineering models) will better allocate universal service funding than a cost proxy model. However, if the Commission does adopt a cost proxy model, the Commission must ensure that the input values used are fully reflective of the actual costs of installing and maintaining a reliable network.

(...Continued)
[110] FNPRM, ¶ 176.

Therefore, GTE urges the Commission to consider the foregoing recommendations and reject the "data shopping" practices used to develop inputs for the Hatfield Model.

Respectfully submitted,

GTE SERVICE CORPORATION and its affiliated domestic telephone operating and wireless companies

By: Suzanne Yelen

Jeffrey S. Linder
Gregory J. Vogt
Suzanne Yelen
WILEY, REIN & FIELDING
1776 K Street, N.W.
Washington, D.C. 20006
(202) 429-7000

Gail L. Polivy
GTE Service Corporation
1850 M Street, N.W.
Suite 1200
Washington, D.C. 20036
(202) 463-5214

Richard McKenna
GTE Telephone Operations
600 Hidden Ridge
Irving, TX 75038
(972) 718-6362

Its Attorneys

October 17, 1997

CERTIFICATE OF SERVICE

I hereby certify that on this 17th day of October, 1997, I caused copies of the foregoing COMMENTS OF GTE SERVICE CORPORATION to be served on:

VIA HAND DELIVERY

The Honorable Rachelle B. Chong,
Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 844
Washington, D.C. 20554

The Honorable Susan Ness,
Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 832
Washington, D.C. 20554

The Honorable James H. Quello,
Commissioner
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, D.C. 20554

Tom Boasberg
Office of the Chairman
Federal Communications Commission
1919 M Street, N.W., Room 814
Washington, D.C. 20554

James Casserly
Office of Commissioner Ness
Federal Communications Commission
1919 M Street, N.W., Room 832
Washington, D.C. 20554

Kathleen Franco
Office of Commissioner Chong
Federal Communications Commission
1919 M Street, N.W., Room 844
Washington, D.C. 20554

Paul Gallant
Office of Commissioner Quello
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, D.C. 20554

Emily Hoffnar, Federal Staff Chair
Accounting and Audits Division
Universal Service Branch
Federal Communications Commission
2100 M Street, N.W., Room 8617
Washington, D.C. 20554

Timothy Peterson, Deputy Division Chief
Accounting and Audits Division
Federal Communications Commission
2100 M Street, N.W., Room 8613
Washington, D.C. 20554

International Transcription Service (ITS)
1231 20th Street, N.W.
Washington, D.C. 20036

Sheryl Todd (8 copies & diskette)
Accounting and Audits Division
Universal Service Branch
Federal Communications Commission
2100 M Street, N.W., Room 8611
Washington, D.C. 20554

VIA FIRST CLASS MAIL

The Honorable Julia Johnson, State Chair,
Chairman
Florida Public Service Commission
2540 Shumard Oak Boulevard
Gerald Gunter Building
Tallahassee, FL 32399-0850

The Honorable David Baker,
Commissioner
Georgia Public Service Commission
244 Washington Street, S.W.
Atlanta, GA 30334-5701

Philip F. McClelland
Pennsylvania Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, PA 17120

The Honorable Sharon L. Nelson, Chairman
Washington Utilities and Transportation Commission
1300 South Evergreen Park Dr. S.W.
P.O. Box 47250
Olympia, WA 98504-7250

The Honorable Laska Schoenfelder, Commissioner
South Dakota Public Utilities Commission
State Capitol, 500 E. Capitol Street
Pierre, SD 57501-5070

Martha S. Hogerty
Public Counsel for the State of Missouri
301 West High Street, Suite 250
P.O. Box 7800
Jefferson City, MO 65102

Charles Bolle
South Dakota Public Utilities Commission
State Capitol, 500 E. Capitol Street
Pierre, SD 57501-5070

Deone Bruning
Nebraska Public Service Commission
300 The Atrium
1200 N Street, P.O. Box 94927
Lincoln, NE 68509-4927

Rowland Curry
Texas Public Utility Commission
1701 North Congress Avenue
P.O. Box 13326
Austin, TX 78701

Bridget Duff, State Staff Chair
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0866

Sandra Makeeff
Iowa Utilities Board
Lucas State Office Building
Des Moines, IA 50319

Lori Kenyon
Alaska Public Utilities Commission
1016 West Sixth Avenue, Suite 400
Anchorage, AK 99501

Debra M. Kriete
Pennsylvania Public Utilities Commission
Commonwealth and North Avenues
North Office Building, Room 110
P.O. Box 3265
Harrisburg, PA 17105-3265

Thor Nelson
Colorado Office of Consumer Counsel
1580 Logan Street, Suite 610
Denver, CO 80203

Barry Payne
Indiana Office of the Consumer Counsel
100 North Senate Avenue, Room N501
Indianapolis, IN 46204-2208

James Bradford Ramsay
National Association of Regulatory Utility Commissioners
1100 Pennsylvania Avenue, N.W.
P.O. Box 684
Washington, D.C. 20044-0684

Brian Roberts
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

Keven Schwenzfeier
NYS Department of Public Service
3 Empire State Plaza
Albany, NY 12223

Tiane Sommer
Georgia Public Service Commission
244 Washington Street, S.W.
Atlanta, GA 30334-5701

Daphne A. Johnson

Daphne A. Johnson

ATTACHMENT 1

NATIONAL ECONOMIC
RESEARCH ASSOCIATES
777 SOUTH FIGUEROA STREET, SUITE 4200
LOS ANGELES, CALIFORNIA 90017
TEL: 213 346.3000 FAX: 213 346.3030

nera
Consulting Economists

EXPENSE DEPENDENCIES
IN THE
ARMIS ACCOUNTS

Forecasting Expenses Empirically

by

Gregory M. Duncan, Ph.D.

and

Karyn E. Model, Ph.D.

October 2, 1997

I. EXPENSES

Engineering or hybrid types of cost models often use a scaling assumption to handle expenses and common costs. For example, if investment in account i is I_i and expense for this account is E_i, then the ratio, $f_i = E_i/I_i$, is called an expense factor; for any given expense category this factor is assumed to be constant, that is, it is assumed that for all possible values of I and E the same ratio will prevail. For example, in the case of Central Office Switching, a ten percent decrease in the price of switches will result in a 10% decrease in the expense. Other times, instead of a constant expense to investment ratio, a constant expense to lines ratio is assumed. Thus if lines decrease, the associated expenses are assumed to decrease proportionately., Both assumptions have implications for the treatment of expenses in forward-looking models. Constant expense to investment factors have the property that a decrease in the price of the investment that does not change the physical units of investment will cause a proportional decrease in expenses. This would suggest a building picked up in a foreclosure sale would need proportionally less janitorial service and normal maintenance than an identical building that cost more.

Both assumptions attempt to capture the relationship between inputs or categories of inputs, outputs, and output prices. Alternatively, one can analyze publicly available data and find out what actually drives expenses. In the following, we use a forecasting approach which, among other things, explicitly accounts for technological change and so is forward-looking. In that sense, it resembles the mechanism used by the FCC to estimate PCI adjustment factors, where data on past values of observed productivity and input price changes are used to forecast the next year's value, which is then used to determine the price cap. The methods used here are somewhat more complicated though in no way arcane; everything was done using SAS.

II. DATA

We use a panel of 6 years of ARMIS data for the Tier 1 companies. Each expense account is treated as a single equation in a system of equations. The form of each equation is a standard autoregressive distributed lag regression with fixed firm effects. The model is parameterized so that the long run relations and the effect of technological change are easily identified;the latter effect is identified with exogenous changes in expenses with everything but the passage of time held constant. For each expense category, we consider the following as drivers: past values of expenses, past values of investments, subscribed lines, access minutes, switches, wages, electricity prices, et cetera. Each variable is allowed to reveal whether or not it is a driver by evaluating the effect on various model selection statistics such as Mallows C(p), Akaike Information Criterion AIC, and Madalla's 't less than one rule'.

The results can be simply summarized. In most cases, external forces such as changes in subscribers, access minutes, wages of kilowatt hour prices drive expenses and only rarely effect investments.

III. AUTOREGRESSIVE DISTRIBUTED LAGS

For simplicity, we consider a single equation with dependent variable y (an expense account), and drivers x and z.. An ADL model with one autoregressive lag, two distributed lags on x, and one on z has the form:

$$y_t = \beta_1 * y_{t-1} + \gamma_1 * x_{t-1} + \gamma_2 * x_{t-2} + \eta_0 * z_t + \eta_1 z_{t-1} + \varepsilon_t$$

Such a specification says that y today is affected by y last period, the last two periods of x, the current z, and last period's z. Without loss of generality, the model can be written in a much more useful form:

$$y_t = \beta_1 * y_{t-1} + (1-\beta_1) * (\Gamma_1 * x_{t-1} + A_2 * \Delta x_{t-1} + E * z_t + E_1 * \Delta z_t) + \varepsilon_t$$

In this form, the long-run equilibrium values can be ascertained by setting all Δ'd terms to zero, equalizing all lags with their current values, and solving for y in terms of z and x:

$$\begin{aligned} y &= \beta_1 * y + (1-\beta_1) * (\Gamma_1 * x + A_2 * 0 + E * z + E_1 * 0) \\ &= \beta_1 * y + (1-\beta_1) * (\Gamma_1 * x + A_2 * 0 + E * z + E_1 * 0) \\ (1-\beta_1) * y &= (1-\beta_1) * (\Gamma_1 * x + E * z) \\ y &= (\Gamma_1 * x + E * z) \end{aligned}$$

Which gives a long run relation of:

$$y = (\Gamma_1 * x + E * z)$$

When the variables are logarithmic, the effect of exogenous intertemporal changes, called autonomous changes, includes technological change and equals $(1-\beta_1)$.

To use these relationships in a forward-looking study, one has two choices. First, one can use the long-run relationship to predict next year's expenses, e.g. assume that all the technological change and adjustment occurs now. Alternatively, one can use the short-run relationship to forecast next year's value or a sequence of forward-looking expenses, much as is done in the aforementioned PCI adjustment. The problem with the former is that the growth term picks up more than just technological change. Changes in input prices not captured in the model which nonetheless vary systematically with time also will be picked up. Changes in input prices that do not change systematically, however, will be ignored. Since using the long run relationships would ignore important, unsystematic changes in the economy, the short run forecast, updated periodically with new data and estimates, is the appropriate method. The hypothetical long run relationships should be used only for consistency checks of generally accepted relationships between variables, e.g. complements should vary directly, substitutes inversely.

In the Tables below, we present the results for each of 16 Armis accounts. The dependent variables, or accounts, are defined in the following table along with the relative share which each account contributes to total expenses:

ARMIS EXPENSE CATEGORIES		
Account	**Description**	**Share**
F110N	Aircraft And Special Vehicles (Tot)	0.00
F121N	Buildings (Tot)	0.06
F122N	Furniture (Tot)	0.01
F123N	Office Equipment (Tot)	0.01
F124N	Office Equipment (Tot)	0.10
F210N	CO Switching (Tot)	0.09

F220N	Operator Systems (Tot)	0.00
F230N	CO Transmission (Tot)	0.03
F351N	Pub Tel Terminal Equip (Tot)	0.01
F410N	Total Cable + Wire Facilities (Tot)	0.17
F411N	Poles (Tot)	0.01
F421N	Aerial Cable (Tot)	0.07
F422N	Underground Cable (Tot)	0.01
F423N	Buried Cable (Tot)	0.08
F441N	Conduit Systems (Tot)	0.00
F710N	Corporate Expenses (Tot)	0.36

The following lagged and lag-differenced independent variables were allowed to enter into the model in log form: expenses, investment, lines, calls, access, toll, km. copper, km. fiber, central office switches without remotes, central office remote switches, average weekly earnings, average revenue per kilowatt hour. A full set of company-specific dummy variables was included, as was the square mileage of the studyarea.

In the results, the "A" coefficient represents the intercept, and the "B" coefficient is the effect of lagged expenses on current expenses. A coefficient of the form Li_X indicates the effect of a change in the level or lagged level of variable X in account i=1,...,16. Acoefficient of the form Di_X indicates the effect of a change in the difference of variable X in account i=1,...,16. A coefficient of the form LDi_X indicates the effect of a change lagged difference of variable X in account i=1,...,16. The term (1- bi) always estimates autonomous change.

We illustrate the points above with a detailed description of the short-run model results for three accounts. The full set of results is attached as an Appendix.

A. Central Office Switching Expenses

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F210N	B6_	0.757937	0.06603	11.48	0.0001
	A6_	-1.583985	0.93966	-1.69	0.096
	L6_F210D	0.228077	0.07291	3.13	0.0025
	L6_AWE	0.174311	0.13757	1.27	0.209
	E6_NENH	-0.435721	0.08547	-5.1	0.0001
	LD6_210N	-0.394691	0.09103	-4.34	0.0001
	LD6_210D	0.151365	0.06211	2.44	0.0171
	LD6_CALL	0.79894	0.27733	2.88	0.0052
	LD6_ARK	0.794493	0.32257	2.46	0.016

The regression results for F210N correspond to Central Office Switching Expenses. Here, the stepwise selection procedure indicates that first and second lags of expenses in central office switching have a highly significant relationship with current expenses. For this category, first and second lags of investment in central office switching also have a significant effect on expenses. A 99% confidence interval on the lagged variable does not include the coefficient value of 1.0 and suggests that expenses and investment do not behave with a one-to-one relationship. The selection procedure also indicates that lagged average weekly earnings and average revenue perkilowatt hour (two measures of input prices) exert significant influence on central office switching expenses, as does the lagged difference of the number of calls (a measure of demand growth). One firm indicator variable also enters the equation. Note, for this category, the number of lines does not enter the model.

B. Total Buried Cable Expenses

The results for category F423N refer to Total Buried Cable Expenses. Notice that no investment (F423D) terms enter the equation, so no significant relationship between buried cable expenses and investment is revealed. Instead, buried Cable expense is found to depend on two lags of buried cable expenses and , the square mileage of the study area, as would be expected for an expense category that is distance-sensitive. Also contributing to these expenses are last periods' total kilometers of fiber cable and central office remote switches as well as two lags of average weekly earnings and the number of poles. A number of firm-specific dummy variables also enter into the model. Note again that the number of lines does not enter the specification.

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F423N	B14_	1.064733	0.01888	56.4	0.0001
	A14_	1.429523	0.47181	3.03	0.0035
	E14_SQMI	-0.063029	0.01751	-3.6	0.0006
	L14_FIB	0.080147	0.01967	4.08	0.0001
	L14_WR	-0.074566	0.0145	-5.14	0.0001
	L14_AWE	-0.268464	0.07201	-3.73	0.0004
	E14_GCCA	-0.097369	0.04797	-2.03	0.0464
	E14_GCID	-0.107198	0.05693	-1.88	0.064
	E14_GCMO	0.09812	0.07776	1.26	0.2114
	E14_MSID	0.216294	0.0853	2.54	0.0136
	E14_MSUT	0.187779	0.08923	2.1	0.0391
	E14_NENH	0.224393	0.05287	4.24	0.0001
	E14_NJNJ	-0.265838	0.07605	-3.5	0.0008
	E14_NWIA	0.093939	0.05929	1.58	0.1178
	E14_PTNV	0.653466	0.09886	6.61	0.0001
	LD14_423	-0.460867	0.07817	-5.9	0.0001
	LD14_POL	-0.344217	0.10605	-3.25	0.0018
	LD14_AWE	-1.716802	0.47097	-3.65	0.0005

C. Corporate Expenses

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F710N	A16_	-0.745136	0.17788	-4.19	0.0001
	L16_700D	0.902413	0.02041	44.22	0.0001
	L16_WXR	0.126759	0.02961	4.28	0.0001
	E16_GCMO	-0.368553	0.12892	-2.86	0.0055
	E16_GCVA	0.180513	0.06597	2.74	0.0078
	E16_MBMI	-0.383545	0.116	-3.31	0.0015
	E16_NENH	0.272949	0.07038	3.88	0.0002
	E16_OBOH	-0.346631	0.08389	-4.13	0.0001
	LD16_700	0.44039	0.32962	1.34	0.1856

	LD16_COP	1.011833	0.18179	5.57	0.0001
	LD16_WR	0.291733	0.07798	3.74	0.0004

Finally, consider the results for F710N, Corporate Expenses, i.e. "overhead." This expense depends significantly on two lags of operating expenses (L16_700D and LD16_700), as would be expected. Also entering the model is lagged central office switches (without remotes), two lags of total kilometers of copper cable, and central office remote switches. A number of firm-specific dummy variables also enters the equation. "Overhead" does not vary with lagged overhead, i.e., it is determined in the current period based on lagged explanatory variables and firm dummies.

IV. IMPLICATIONS

The implications for Expense and Adjustments subjects at issue for the FCC are as follows:

1. The results vary by expense account, but the models presented above suggest that expenses generally are not driven by investment levels and may be estimated empirically based on lags of demand and price indicators. Using this methodology, the number of lines and the amount of investment are incorporated into the model.

2. The model and forecasting methodology implicitly accounts for company size since it includes demand drivers, such as the number of lines, calls, etc., which vary directly with company size. We also account for unobservable company characteristics by the inclusion of company-specific indicator variables.

3. The model determines forward-looking expenses empirically. Variables that significantly affect expenses will enter. Thus, the model determines which factors influence expenses based on empirical facts, not on theoretical presuppositions.

4. Expenses that are covered by universal service should be defined by the characteristics of universal service. We do not address this with the model.

5. Expenses should be forecast annually with updated data to allow for the effect of year-to-year changes in demand, input prices, and other variables.

6. The model implicitly includes inflation and productivity through the inclusion of input prices and lagged expenses. The coefficient on lagged expenses reflects technological change and any residual change in input prices not accounted for by the inclusion of input price indices. Optimally, the model would include more data on input prices, such as the C.A. Turner telecommunications price indices. However, these firm-spcific data are proprietary The model does include firm dummies, so company specific characteristics (including input prices) are accounted for.

APPENDIX: COMPLETE RESULTS FOR EXPENSE DEPENDENCIES MODEL

A. F110N Aircraft And Special Vehicles (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F110N	B1_	0.911983	0.06296	14.49	0.0001
	A1_	0.336914	0.41995	0.8	0.4249
	E1_MSNM	-1.702621	0.50074	-3.4	0.0011
	E1_NEMA	-1.144685	0.57727	-1.98	0.051
	E1_OBOH	-2.923757	0.70846	-4.13	0.0001
	E1_PNOR	-1.585794	0.50669	-3.13	0.0025
	E1_PNWA	-1.65691	0.51143	-3.24	0.0018
	LD1_F110N	-0.433144	0.10899	-3.97	0.0002
	LD1_WR	1.502779	0.62461	2.41	0.0186
	LD1_AWE	-11.358312	6.52084	-1.74	0.0856

B. F121N Buildings (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F121N	B2_	0.982843	0.0097224	101.09	0.0001
	A2_	0.474594	0.09541	4.97	0.0001
	L2_FIB	-0.026384	0.01187	-2.22	0.0296
	E2_GCTX	-0.07349	0.03646	-2.02	0.0478
	E2_GCWA	-0.116898	0.05527	-2.12	0.0381
	E2_GTFL	-0.179879	0.0705	-2.55	0.013
	E2_GTOH	0.153353	0.07378	2.08	0.0414
	E2_MBMI	-0.138102	0.07338	-1.88	0.0641
	E2_NWSD	-0.226625	0.05417	-4.18	0.0001
	E2_PNOR	-0.064481	0.0365	-1.77	0.0818
	E2_PTNV	-0.137938	0.07233	-1.91	0.0607
	LD2_F121N	-0.149721	0.06397	-2.34	0.0222
	LD2_F121D	-1.375869	0.36496	-3.77	0.0003
	LD2_CALL	0.291804	0.12357	2.36	0.0211
	LD2_ACC	-0.58673	0.26038	-2.25	0.0275
	LD2_WXR	-0.18662	0.04938	-3.78	0.0003
	LD2_WR	-0.109448	0.05025	-2.18	0.0329

C. F122N Furniture (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F122N	B3_	0.175963	0.09995	1.76	0.0826
	A3_	-4.348636	0.9566	-4.55	0.0001
	L3_F122D	0.348756	0.10867	3.21	0.002
	L3_LINES	-0.702765	0.28179	-2.49	0.0149
	L3_CALLS	1.275954	0.24204	5.27	0.0001
	L3_POLES	-0.327921	0.12392	-2.65	0.01
	E3_MBMI	-0.997636	0.4682	-2.13	0.0365
	E3_MSID	-0.786086	0.51137	-1.54	0.1286
	E3_NENH	-0.55159	0.2783	-1.98	0.0513
	LD3_F122N	0.171916	0.10671	1.61	0.1115
	LD3_WXR	-0.866662	0.31774	-2.73	0.008
	LD3_ARK	3.762678	1.07608	3.5	0.0008
	LD3_AWE	6.04229	3.00545	2.01	0.0481

D. F123N Office Equipment (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F123N	B4_	0.696013	0.07488	9.3	0.0001
	A4_	-1.810079	0.55201	-3.28	0.0016
	E4_NJNJ	-0.584356	0.18192	-3.21	0.0019
	E4_OBOH	-0.758115	0.17665	-4.29	0.0001
	L4_CALLS	0.223512	0.069	3.24	0.0018
	L4_POLES	0.07436	0.05482	1.36	0.1789

E. F124N Office Equipment (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F124N	B5_	0.950493	0.03001	31.67	0.0001
	A5_	6.275069	0.81432	7.71	0.0001
	L5_LINES	0.340083	0.05109	6.66	0.0001
	L5_TOLL	-4.198578	0.52782	-7.95	0.0001
	L5_COP	0.095627	0.02791	3.43	0.001
	E5_GCTX	0.077391	0.05462	1.42	0.1611
	E5_GCVA	0.113114	0.04991	2.27	0.0266
	E5_GCWA	0.16632	0.06355	2.62	0.0109
	E5_MSCO	-0.205952	0.08548	-2.41	0.0187
	E5_MSUT	0.298066	0.09086	3.28	0.0016
	E5_NENH	0.128368	0.04918	2.61	0.0111
	E5_NYNY	-0.087981	0.05216	-1.69	0.0963
	E5_OBOH	-0.390119	0.06295	-6.2	0.0001
	E5_PNWA	-0.102662	0.04549	-2.26	0.0273
	LD5_F124N	-0.155485	0.0681	-2.28	0.0255
	LD5_CALL	-0.437459	0.14618	-2.99	0.0039
	LD5_WXR	0.193432	0.05674	3.41	0.0011

F. F210N CO Switching (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F210N	B6_	0.757937	0.06603	11.48	0.0001
	A6_	-1.583985	0.93966	-1.69	0.096
	L6_F210D	0.228077	0.07291	3.13	0.0025
	L6_AWE	0.174311	0.13757	1.27	0.209
	E6_NENH	-0.435721	0.08547	-5.1	0.0001
	LD6_F210N	-0.394691	0.09103	-4.34	0.0001
	LD6_F210D	0.151365	0.06211	2.44	0.0171
	LD6_CALL	0.79894	0.27733	2.88	0.0052
	LD6_ARK	0.794493	0.32257	2.46	0.016

G. F220N Operator Systems (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F220N	B7_	0.606033	0.0852	7.11	0.0001
	A7_	-5.094692	1.69823	-3	0.0038
	L7_FIB	-0.997621	0.22666	-4.4	0.0001
	L7_WR	0.787159	0.17509	4.5	0.0001
	L7_LINES	0.969193	0.23165	4.18	0.0001
	E7_GCKY	4.110792	0.76676	5.36	0.0001
	E7_GCMO	-2.993087	1.11444	-2.69	0.0091
	E7_GTMI	1.402329	0.5591	2.51	0.0145
	E7_MSAZ	-1.981508	1.02467	-1.93	0.0572
	E7_MSUT	-2.92646	1.08059	-2.71	0.0085
	E7_NEMA	-1.122046	0.63702	-1.76	0.0826
	E7_NENH	-1.109595	0.57621	-1.93	0.0583
	E7_NWMN	-2.008129	0.75138	-2.67	0.0094
	LD7_F220N	-0.322596	0.08099	-3.98	0.0002
	LD7_WXR	-1.579673	0.68653	-2.3	0.0244
	LD7_AWE	10.172519	7.08991	1.43	0.1559

H. F230N CO Transmission (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F230N	B8_	1.018312	0.01309	77.8	0.0001
	A8_	-0.179629	0.11931	-1.51	0.1362
	E8_GCCA	-0.291892	0.07564	-3.86	0.0002
	E8_GCID	-0.192024	0.09293	-2.07	0.0421
	E8_GCKY	0.307798	0.1056	2.91	0.0046
	LD8_POLE	-0.831011	0.18167	-4.57	0.0001
	LD8_COP	0.493842	0.21258	2.32	0.0228

I. F351N Pub Tel Terminal Equip (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F351N	B9_	0.524116	0.07719	6.79	0.0001
	A9_	-4.170299	1.02362	-4.07	0.0001
	L9_F351D	0.331876	0.08125	4.08	0.0001
	L9_FIB	-0.064114	0.03066	-2.09	0.0404
	L9_CALL	0.175693	0.06617	2.66	0.0099
	L9_AWE	0.41781	0.15218	2.75	0.0078
	E9_GCKY	0.501064	0.11891	4.21	0.0001
	E9_GCWA	-1.028611	0.14228	-7.23	0.0001
	E9_GTWI	0.257097	0.09146	2.81	0.0065
	E9_MSCO	0.763567	0.16133	4.73	0.0001
	E9_MSID	0.616295	0.17401	3.54	0.0007
	E9_NYNY	0.405436	0.12231	3.31	0.0015
	E9_OBOH	-0.391166	0.12111	-3.23	0.0019
	E9_PTCA	-0.282463	0.10066	-2.81	0.0066
	E9_PTNV	0.363483	0.17671	2.06	0.0436
	LD9_351N	-0.396353	0.09009	-4.4	0.0001
	LD9_ACC	0.948994	0.53602	1.77	0.0813
	LD9_TOLL	-4.217424	0.93519	-4.51	0.0001
	LD9_ARK	1.351221	0.35609	3.79	0.0003

J. F410N Total Cable + Wire Facilities (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F410N	A10_	-1.099286	0.19488	-5.64	0.0001
	L10_410D	0.919503	0.02819	32.62	0.0001
	L10_ACC	0.103231	0.03234	3.19	0.0022
	L10_FIB	0.117318	0.01766	6.64	0.0001
	L10_WXR	-0.049196	0.01418	-3.47	0.0009
	L10_WR	-0.093029	0.01407	-6.61	0.0001
	L10_ARK	0.074265	0.02377	3.12	0.0026
	E10_GCCA	-0.094624	0.03321	-2.85	0.0058
	E10_GTMI	-0.088457	0.03175	-2.79	0.0069
	E10_MSID	0.10605	0.05997	1.77	0.0815
	E10_MSUT	0.182434	0.08419	2.17	0.0338
	E10_NEMA	0.083647	0.04278	1.96	0.0547
	E10_NJNJ	-0.324649	0.07199	-4.51	0.0001
	E10_NWIA	0.0673	0.04233	1.59	0.1166
	E10_PTNV	0.379221	0.088	4.31	0.0001
	LD10_410	-0.382328	0.06372	-6	0.0001
	LD10_POL	-0.388025	0.10159	-3.82	0.0003
	LD10_TOLL	0.760602	0.42594	1.79	0.0787

K. F411N Poles (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F411N	B11_	0.943593	0.03338	28.27	0.0001
	A11_	0.819502	0.28869	2.84	0.0058
	LD11_F411N	-0.584409	0.09847	-5.93	0.0001
	LD11_LIN	2.20542	1.73784	1.27	0.2082
	LD11_ACC	-3.954381	1.32312	-2.99	0.0037
	LD11_WR	0.559813	0.26138	2.14	0.0353
	LD11_AWE	-7.725566	2.58579	-2.99	0.0038

L. F421N Aerial Cable (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F421N	B12_	1.090062	0.03931	27.73	0.0001
	A12_	-1.795337	0.62333	-2.88	0.0053
	L12_F421D	-0.132035	0.03904	-3.38	0.0012
	L12_TOLL	1.237617	0.34878	3.55	0.0007
	L12_COP	-0.116054	0.03779	-3.07	0.0031
	L12_FIB	0.131359	0.02591	5.07	0.0001
	L12_WR	-0.097979	0.02056	-4.77	0.0001
	E12_GCVA	0.10143	0.04876	2.08	0.0413
	E12_GTHI	0.079676	0.05518	1.44	0.1535
	E12_MSUT	0.151171	0.10308	1.47	0.1472
	E12_NEMA	0.145933	0.0588	2.48	0.0156
	E12_NENH	0.19679	0.05059	3.89	0.0002
	E12_NJNJ	-0.335122	0.08593	-3.9	0.0002
	E12_NWSD	0.163572	0.0559	2.93	0.0047
	E12_PTNV	0.487488	0.11093	4.39	0.0001
	LD12_F421N	-0.414997	0.06957	-5.97	0.0001
	LD12_TOL	1.769819	0.61547	2.88	0.0054
	LD12_POL	-0.328086	0.13112	-2.5	0.0148

Note here that investment enters negatively. This suggests that for this account the inputs captured in the expense account are strong substitutes for inputs captured in the investment account.

F422N Underground Cable (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F422N	B13_	0.505831	0.06958	7.27	0.0001
	A13_	-6.185421	0.82583	-7.49	0.0001
	L13_LINE	0.790553	0.10907	7.25	0.0001
	L13_ARK	0.197001	0.10735	1.84	0.0707
	E13_GTFL	-0.953233	0.26056	-3.66	0.0005
	E13_GTHI	0.647437	0.18217	3.55	0.0007
	E13_GTMI	-0.672648	0.15495	-4.34	0.0001
	E13_MSUT	0.399051	0.27636	1.44	0.1531
	E13_NJNJ	-0.447545	0.20699	-2.16	0.034
	E13_PNOR	0.333444	0.1375	2.43	0.0179
	E13_PTNV	1.157979	0.31514	3.67	0.0005
	LD13_F422D	4.174256	1.37666	3.03	0.0034
	LD13_ACC	2.703967	0.90253	3	0.0038
	LD13_AWE	5.687968	1.73872	3.27	0.0017

M. F423N Buried Cable (Tot)

Equation	Parameter	Estimate	Std. Error	Ratio	Prob > |t|
F423N	B14_	1.064733	0.01888	56.4	0.0001
	A14_	1.429523	0.47181	3.03	0.0035
	E14_SQMI	-0.063029	0.01751	-3.6	0.0006
	L14_FIB	0.080147	0.01967	4.08	0.0001
	L14_WR	-0.074566	0.0145	-5.14	0.0001
	L14_AWE	-0.268464	0.07201	-3.73	0.0004
	E14_GCCA	-0.097369	0.04797	-2.03	0.0464
	E14_GCID	-0.107198	0.05693	-1.88	0.064
	E14_GCMO	0.09812	0.07776	1.26	0.2114
	E14_MSID	0.216294	0.0853	2.54	0.0136
	E14_MSUT	0.187779	0.08923	2.1	0.0391
	E14_NENH	0.224393	0.05287	4.24	0.0001
	E14_NJNJ	-0.265838	0.07605	-3.5	0.0008
	E14_NWIA	0.093939	0.05929	1.58	0.1178
	E14_PTNV	0.653466	0.09886	6.61	0.0001
	LD14_F423N	-0.460867	0.07817	-5.9	0.0001
	LD14_POL	-0.344217	0.10605	-3.25	0.0018
	LD14_AWE	-1.716802	0.47097	-3.65	0.0005